ADVISORY CIRCULAR

DEPARTMENT OF TRANSPORTATION
Federal Aviation Administration
Washington, D.C.

Subject: ENGINE POWER-LOSS ACCIDENT PREVENTION

1. PURPOSE. This advisory circular updates statistical information and brings to the attention of aircraft owners, operators, manufacturers, and maintenance personnel the circumstances surrounding engine power-loss accidents with recommendations on how, through individual effort and consideration, those accidents can be prevented.

2. CANCELLATION. Advisory Circular 20-105, Engine Power-Loss Accident Prevention, dated 6/9/78 is cancelled.

3. BACKGROUND. A review of Federal Aviation Administration's General Aviation Accidents Factual Reports for the years 1977, 1978, and 1979, that list engine failure as a cause, showed a total of 2,608 accidents. Those accidents resulted in 473 fatalities and 1,396 injured persons. For several years, "power loss" has been the greatest single type of general aviation accident and during this review period accounted for 19.9 percent of all accidents. Analysis shows that accidents have resulted from:

a. Personnel Errors.

(1) Operations which exceeded the limitations of the powerplant.

(2) Failure of maintenance personnel to utilize acceptable maintenance procedures.

b. Failure of Engine, Engine Part, or System Component.

(1) Engines were operated beyond the overhaul time recommended by the manufacturer.

(2) There was noncompliance with airworthiness requirements regarding inspection, overhaul, repair, preservation, and/or replacement of parts.

(3) Design changes and alterations were completed without engineering evaluation and approval.

(4) Parts failed due to operation outside operating limitations; i.e., overtemp, overboost, low oil pressure, etc.

c. Fuel Starvation and Exhaustion.

(1) Fuel starvation (fuel on board the aircraft but not supplied to the engine(s)) and fuel exhaustion (no fuel available on board the aircraft) resulted in 47 percent of the engine power-loss accidents. This usually results from improper preflight planning or improper fuel management procedures.

(2) Contamination continues to be a notable factor in fuel starvation accidents. During this review period of the 1,230 engine power-loss accidents related to fuel system, fuel contamination was a cause in 381 or 31 percent of those accidents. Advisory Circular 20-43C, Aircraft Fuel Control, contains valuable information that alerts the aviation community to the possibility of inadvertent mixing or contamination of turbine and piston fuel and provides recommended servicing procedures.

d. Fuel System Design. Accidents have resulted because pilots and maintenance personnel failed to become familiar with the different fuel systems and operating procedures. Design changes, accomplished without proper evaluation, the lack of standardization of controls configuration among aircraft, plus the peculiarities in aircraft fuel system designs, have contributed to power-loss accidents.

4. RECOMMENDATIONS. The following are recommended operating practices that could help reduce engine power-loss accidents:

a. General.

(1) Know the limitations of the aircraft and aircraft powerplant. Avoid operating in excess of those limitations. Be sure all engine(s) are within acceptable operating parameters prior to takeoff. Keep proficient in all engine and systems operating procedures, including emergency procedures. The aircraft flight manual or the rotorcraft flight manual contain the normal and emergency procedures, and proper power assurance check procedures. Use the checklist during normal and emergency operations.

(2) Follow the manufacturer's operating instructions. Have a qualified person investigate all abnormal engine operating conditions (oil and fuel consumption, low power, vibration, engine instrument readings, etc).

(3) Positively utilize a powerplant and propeller maintenance program which gives full consideration to the Federal Aviation Regulations and manufacturer's recommendations.

(4) Keep abreast of technical information related to the aircraft fuel, oil, parts, airworthiness directives, manufacturer's technical publications, etc.

(5) Know proper procedures when engine inlet or carburetor icing conditions are encountered.

(6) Follow engine manufacturer's inspection procedures following propeller strike or sudden engine stoppage.

(7) Operate engine controls smoothly, as abrupt movements can result in engine malfunction and power loss.

(8) Avoid overspeed, overboost, and overheat.

(9) Do not fly an aircraft with known engine discrepancies.

b. Fuel Management.

(1) In relation to airplane performance, the fuel quantity on board the aircraft is only "time in your tanks." Management of that time should rank high on the list of a pilot's priorities. Be fully familiar with the aircraft fuel system and fuel management procedures.

(2) Make adequate preflight preparations to ensure that sufficient clean fuel is on board the aircraft for the time to destination, plus an adequate reserve, predicated on airplane performance.

(3) Know and understand the positions of the aircraft fuel selector valves. Markings should be legible, valves should be easy and smooth to operate and with positive detent action.

(4) Be familiar with the sequence for selecting fuel tanks of the aircraft. The use of fuel from tank(s) other than as recommended (especially during takeoff and landing) can result in eventual fuel starvation. Many aircraft return unused fuel from the carburetor to a tank. If the tank is full, the fuel goes overboard through the vent and is lost, thus reducing range.

(5) A pilot should know the total USABLE fuel on board the aircraft before flying. The UNUSABLE fuel should not be considered when planning a flight.

(6) Make a visual inspection to assure that the fuel tanks are full. If you are in the habit of flying with partial fuel loads, use positive means to know the quantity of fuel on board the aircraft before flight. Complete trust in fuel gauges has often resulted in fuel depletion short of destination and accidents.

(7) Make a thorough fuel drain check of all sumps before flight. Consult the owner's manual for proper procedures.

(8) During preflight inspection, determine that all tank vent openings are clear of obstructions.

(9) Check fuel flow from each tank to engine(s) prior to taxi. Remember to allow sufficient time for this check as the carburetor and lines hold fuel that would have to be used before you would know if there was no fuel flow from a tank.

(10) Determine that hand primers are closed and locked in the detent after use.

(11) Be fully familiar with fuel boost pump operating procedures.

(12) Before switching tanks, check the fuel quantity in the tank to be selected and after moving the selector check the fuel selector position to be sure proper tank is selected.

(13) After switching tanks, monitor the fuel pressure until you are sure there is fuel flow from the tank.

c. Maintenance.

(1) Maintenance should include inspection of fuel cells and tanks for discrepancies such as collapse, contamination, vent obstruction, internal damage, security, leaks, gauge accuracy, and general condition.

(2) Periodically make a visual check of the fuel filter for condition and/or contamination.

(3) Check operation and security of fuel selector and system control handles and/or knobs.

(4) During maintenance, a detailed inspection should be made of fuel quantity indicating system wiring, components, and calibration.

(5) Design changes and alterations to aircraft engines should be done with approved data.

(6) Replacement of engine parts should be completed following manufacturer's instructions.

(7) Maintenance should be accomplished in accordance with the manufacturer's recommendations.

(8) Have a qualified maintenance person dress out propeller blade nicks, dents, scratches, etc., as necessary, to prevent fatigue cracks that could cause propeller blade failure resulting in power-loss. The dressing of propeller blades should be done following the propeller manufacturer's recommended procedures. Excessive dressing could alter the airfoil shape of the propeller blades to the point where propeller efficiency is lost, causing insufficient propeller thrust. In the case of a twin engine aircraft that loss of thrust could prevent the aircraft from maintaining flight with one engine inoperative.

5. SUMMARY. Through the individual and collective efforts of the aviation community, we hope to eliminate factors that have caused engine power-loss accidents. This advisory circular is one of many efforts to try to reduce the "power loss" type of accidents. The simple act of "keeping the engine running" could appreciably reduce the number of accidents.

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